EXPO 2022
engineering ▲ design

Infrasonic Wildfire Detection

A Project from Team FireSense and Stanley Solutions

Objectives

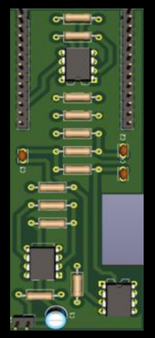
- Design a deployable wildfire detector.
- Reduce the payload per-unit cost.
- Minimize hardware size, maximize reliability.

Value Proposition

- Infrasonic sensors can detect wildfires by listening for low-frequency signatures (< 20Hz).
- Our project will allow for quicker wildfire detection and response times.
- This will result in less damage to homes and businesses and provide peace of mind for people in those areas.

Past Work

- Previous teams prioritized proof of concept work.
- Mesh network: with Python, Plotly, and Networkx.
- Radio testing: range without line of sight.
- Drop testing: real and simulated.
- Payload Delivery method: Parachute.



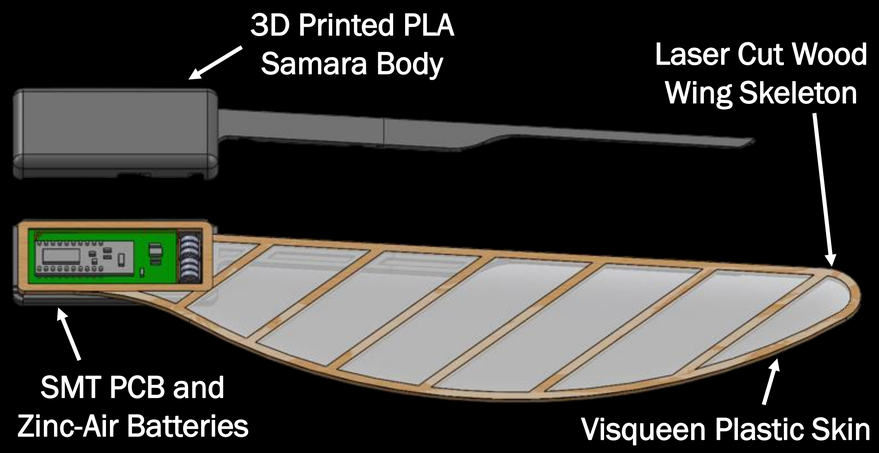
Our Goals

- Construct a more consistent delivery device.
- Redesign the PCB to eliminate the development board.

Our Team

- David Depaolis (EE), Chris Salcido (ME), Nicholas Shipp (CE), Luke Woods (ME)
- Sponsor: Joe Stanley, Stanley Solutions
- Mentors: Dr. Herbert Hess (ECE), Dr, Feng Li (ECE), Abdallah Smadi (ECE), Jack Gonzalez (ME)

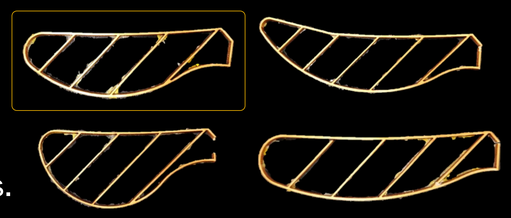
Samara Leaf Payload



Drop Testing

⅕ Scale Model

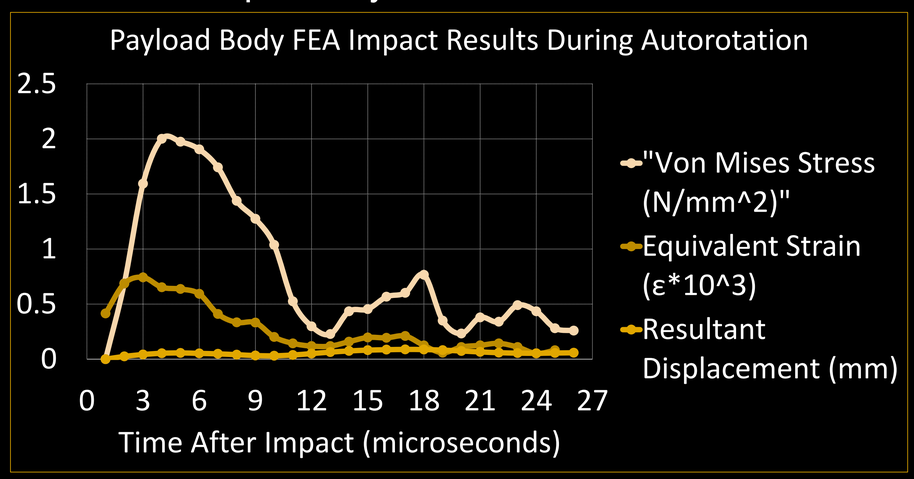
- Velocity: 2.65m/s
- First shape chosen for its neutral flight characteristics.



½ Scale Model

- Velocity: 2.60m/s
- 100% repeatable rotation achieved with nut-centered weight distribution.

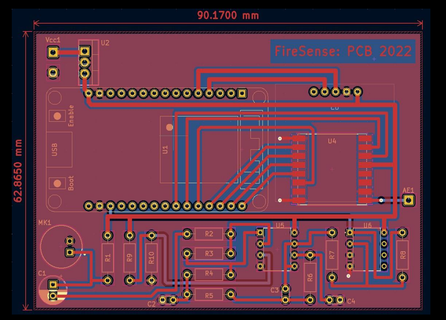
½ Scale Model Impact Analysis



PCB Redesign

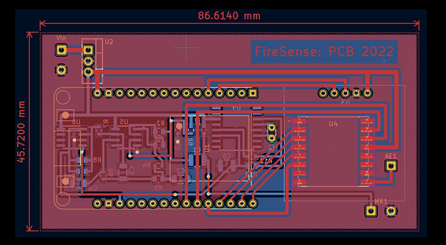
THT Design

- Version 1 of the PCB using through hole filter components.
- Includes Radio, GPS, and Mini Dev. Board.



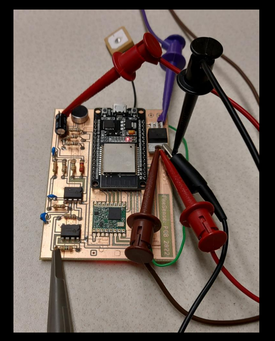
SMT Design

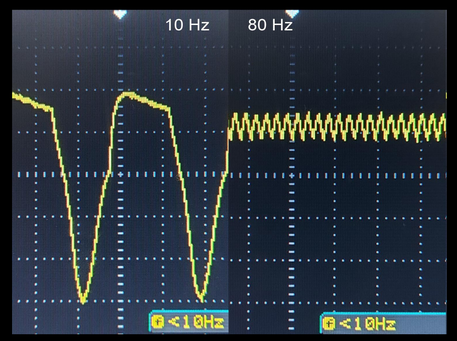
- Version 2 optimized the filter using surface mount components.
- 30% size reduction.



Electronics Per-Unit Cost

- Previous team's components averaged $50 per unit.
- Current component selection has reduced this cost to an average of $32 per unit, reducing PU cost by 36%.





Future Work

- Materials Research provides the possibly to find more environmentally favorable components.
- Bare Chip design would further condense the sensor PCB, reducing the size of the overall payload.
- Mesh network optimizations for reduced power consumption.

Thank You

Joe Stanley and Dr. Hess for their advice and support as mentors for this project.

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